REMARKS

I. Status of the Application

Claims 1-9 and 16-19 are pending in the application. Claims 16-19 are allowed and claims 5 and 6 would be allowable if rewritten in independent form.

Claims 1-4 and 8 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Mihara (JP 405303076) in view of Okada et al. (USP 4,800,382; hereinafter "Okada") and Hashimoto et al. (USP 6,295,043; hereinafter "Hashimoto"). Claims 7 and 9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Mihara in view of Okada, Hashimoto and Surguy (USP 5,233,338). As discussed below, Applicant respectfully traverses the prior art rejections.

II. Prior Art Rejections

Independent claim 1 is drawn to a method for driving an active-matrix liquid crystal display apparatus. Claim 1 recites, in part:

> scanning successively a plurality of scan lines in a first field of a frame for display; [and]
>
> ...
>
> scanning successively the scan lines in a second field of the frame for display in an order reverse to that in the first field....

Thus, claim 1 requires, *inter alia*, that the scanning of the scan lines in a second field occur in an order reverse to the scanning of scan lines in the first field. Applicant submits that none of the cited references teaches or suggest scanning in an opposite direction in a <u>field</u> scanning system.

The Examiner asserts that Mihara discloses this claimed feature in paragraphs [0027] and [0028]. The Examiner also cites Fig. 4 of Mihara as allegedly showing the claimed scanning of the first and second fields. However, Mihara's teachings specifically apply to frames rather than fields.[1] Further, Fig. 4 of Mihara shows the scanning method applied to frames 1, 2 and 3. Therefore, Applicant submits that Mihara fails to teach or suggest scanning in an opposite direction in a field scanning system.

Moreover, Applicant notes that with respect to independent claim 1, the Examiner's position is substantially identical to the previous rejection based on the combination of Mihara and Okada in the previous Office Actions except that the Examiner further cites Hashimoto for disclosing a "driving method could be performed on ... an active matrix type display device." Thus, the Examiner appears to have ignored the claimed features regarding "resetting a voltage difference between pixel electrodes and common electrodes." Applicant submits that one of ordinary skill in the art would not have been motivated to combine the teachings of the cited references because the driving method of the simple matrix system cannot be applied to the active matrix system.

The matrix of the present invention is the active matrix while that for Mihara and Okada is the simple matrix. Although Hashimoto suggests that the disclosed driving method of the simple matrix may be applied to the active matrix system, this recognition is baseless.

With regard to "amplitude selection addressing" of the simple matrix system, ordinarily, row electrodes are at 0V. When the row electrodes are sequentially selected, the selection

[1] See, e.g., Mihara, paragraph [0006].

electrodes is elevated to "S", and then returned to 0V. In the next frame, the selection voltage becomes "-S" by reversing its symbol for preventing the burn-in of the liquid crystal. This selection voltage is not related to image information.

The waveforms applied on a column electrode are a combination of voltages ("D") having reverse symbols with the same amplitude corresponding to ON and OFF of the display of pixels. The voltage applied to the liquid crystal in a first frame is that which equals to difference between the row electrode voltage and the column electrode voltage, and at a moment of row selection, the voltage "S+D" is applied on ON pixels and the voltage "S-D" is applied on OFF pixels. In the next frame, the voltage applied to the column voltage is reversed. As a result, at a moment of the row selection, the voltage "S-D" is applied on ON pixels and the voltage "-S+D" is applied on OFF pixels. Either "+D" or "-D" is applied depending on the image information of the other pixels other than the row selection moment. The response of the liquid crystal is not determined only by these voltage values of "S+D", "S-D", "-S-D", "-S+D", "D" and "-D". That is, in the simple matrix system, the voltage applied to the liquid crystal cannot be maintained in a whole length of one frame so that, as mentioned before, after the application of "S+D", "+D" or "-D", for example, is appropriately applied depending on the other information.

Accordingly, the effective voltage dependency appears. That is, the response is dependent on a root-mean-square voltage. All the voltages of all the pixels ever-changing affect the overall rms pixel voltage. The selection voltage "S" contributes to the response of the liquid crystal.

On the other hand, in the active matrix system shown in Figs. 10a and 10b of Hashimoto, when a selection voltage ("G") is applied on a gate electrode 13, a TFT 11 is turned on and a

voltage ("DA") of a signal electrode 14 is transmitted to a liquid crystal 15 and a retention capacity 12. The liquid crystal is connected to a common electrode 21 and one end of the liquid crystal capacity equals to a common voltage ("C"). In the active matrix system, depending on the symbols for preventing the burn-in, the voltage of "DA-C" or "C-DA" is applied to the liquid crystal (when the symbol of "DA" simply changes every frame in this manner, "C" is ordinarily maintained at 0V). These voltages are maintained also in the periods other than the selection period of the gate electrode. Accordingly, the liquid crystal responds according to only the voltage of the applied data signal (excluding the aftereffect of the present invention). The voltage "G" applied to the gate electrode is related with neither the input pixel information nor the response of the liquid crystal.

When the same selection signal as that of the simple matrix system is used in the active matrix system, the TFT can be turned on in either of polarities (for example, "S") while it can be turned on the other polarity ("-S"). That is, the desired driving cannot be obtained in the active matrix system, and only the data signal having one polarity is applied to produce the burn-in. On the other hand, when the same selection signal to that of the active matrix system is used in simple matrix system, "G+D" is applied on the ON pixels and "G-D" is applied on the OFF pixels in a first frame, and further "G-D" is applied on the ON pixels and "G+D" is applied on the OFF pixels in a second frame. However, there is no difference between the voltages in the ON and OFF pixels in the above case so that the same display appears on the whole panel regardless of the ON-OFF information of the pixels. This problem arises due to the fact that the reverse of the gate electrode signal is unnecessary in the active matrix system and is necessary in

the simple matrix system. The large difference in the selection signal is present between the active matrix system and the simple matrix system.

With regard to the performance of selecting wirings by neglecting the symbol of the selection signal, when the same selection signal as that of the simple matrix system is used in the active matrix system, the desired display cannot be obtained. This is because the data signal of the simple matrix system is made in consideration of the effective voltage and is largely different from the applied voltage directly driving the liquid crystal cell. As mentioned, the selection voltage has an effect in the effective voltage system. The same or similar voltage to that applied for directly driving the liquid crystal cell can be used as the data signal in the active matrix cell. As described, the large difference in the selection signal is present between the active matrix system and the simple matrix system.

With regard to the performance of providing some data signal by neglecting the amplitude of the data signal in addition to focusing to the performance of selecting wirings by neglecting the symbol of the selection signal. The desired display can be obtained in the simple matrix system by selection of the row electrode and supply of the data signal to column electrode. On the other hand, the normal display cannot be guaranteed in the active matrix system only by the operation of the selection of the row electrode and the supply of the data signal to column electrode. The operation applies the data signal on one end of the liquid crystal capacity. However, the common voltage on the other end of the liquid crystal capacity cannot be at all controlled. For example, the data signals are "+DA" and "-DA" in the first and the second frames, respectively, and the common voltage is "-DA", the first frame is turned on (the voltage of "2xDA" is applied to the liquid crystal) while the second frame is turned off (0V is applied to

the liquid crystal). The display of the active matrix system cannot be controlled by the row and the column electrodes different from the simple matrix system. This is because the liquid crystal is present between the pixel electrode (display electrode) and the common electrode in the active matrix system, and the common electrode cannot be controlled by the potentials of the gate electrode and the data electrode.

Accordingly, the driving method of the simple matrix system <u>cannot be applied</u> to the active matrix system.

Independent claim 1 also recites, in part:

> simultaneously resetting a voltage difference between pixel electrodes and common electrodes in the first field <u>after</u> the scan lines are successively scanned in the first field; [and]
>
> ...
>
> simultaneously resetting a voltage difference between pixel electrodes and common electrodes in the second field <u>after</u> the scan lines are successively scanned in the second field.

Therefore, the method of claim 1 requires, *inter alia*, simultaneously <u>resetting</u> a voltage difference between pixel electrodes and common electrodes in the first and second fields <u>after the scan lines are successively scanned</u> in both of the first and second fields.

In the November 25, 2006 Amendment, Applicant argued that the combined references fail to teach or suggest this feature of the claimed invention. However, the Examiner did <u>not</u> respond to this portion of Applicant's arguments. Instead, the Examiner simply repeats her position that Okada teaches these required features. However, Applicant disagrees with the Examiner's position.

Applicant submits that Okada fails to teach or suggest resetting the voltage difference between pixel electrodes and common electrodes in the first and second fields after the scan lines are successively scanned. On the contrary, Okada clearly states that the step C1 is the erasure step, and the step C2 is the writing step.[2] In the C2 step, a scanning signal of 2V0 is applied to the scanning lines.[3] In other words, in Okada, the erasure step C1 clearly occurs before the scanning step C2. As noted above, claim 1 requires that the resetting[4] occur after resetting the voltage difference between pixel electrodes and common electrodes in the first and second fields.

Further, as shown in Figure 6, Okada discloses simultaneously erasing the scan lines by applying a negative pulse $-2V_0$ (i.e., erasing in black) and then successively scanning the scan lines by applying a positive pulse $2V_0$. That is, Okada teaches that the picture elements are erased at the beginning of each field or frame.[5] Thus, contrary to claim 1, the scanning occurs after the erasing.

Similarly, as shown in Figure 4, Mihara discloses applying a negative pulse $-V_2$ (erasing in black) and then applying a positive pulse V_1 (write in white) to each successive scan line in a field of frame. Again, it is clear that the scanning occurs after the erasing, contrary to the claimed method.

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[2] See Okada, col. 5, lines 63-68.

[3] See Okada, col. 5, line 67 to col. 6, line 1.

[4] We note that we are assuming, *arguendo*, that "erasing" as taught by Okada is equivalent to the claimed "resetting."

[5] For example, as discussed at col. 5, lines 59-63, Okada states that "all or a part of the picture elements on the whole picture written in the previous field or frame is erased (written in "black") at the same time and then successively written (in "white")."

Consequently, Okada and Mihara fail to teach or suggest all of the required features of claim 1. Further, Hashimoto fails to cure the deficiencies of Mihara and Okada. Therefore, Applicant submits that the applied references, either alone or in combination, fail to teach or suggest all of the required features of claim 1, for at least the reasons stated above.

Applicant further submits that claims 2-4 and 8 are also patentable over the applied references, at least by virtue of their dependency on claim 1.

Regarding dependent claims 7 and 9, Applicant notes that Surguy fails to cure the deficiencies of the other applied references. Surguy merely discloses a method of sequentially addressing pixels in opposing directions on a display screen.[6] Therefore, Applicant submits that claims 7 and 9 are patentable over the applied references, at least by virtue of their dependency on claim 1.

Additionally, Applicant again submits that independent claim 1 would not have been rendered obvious in view of Mihara, Okada and Hashimoto because one of ordinary skill in the art would not have been motivated to modify the driving method of Mihara based on the teachings of Okada to produce the claimed invention. In particular, and as noted above, Figure 4 of Mihara discloses applying a negative pulse $-V_2$ (erasing in black) and then applying a positive pulse V_1 (write in white) to each successive scan line in a field of frame. As shown in Figure 6, Okada discloses simultaneously erasing the scan lines by applying a negative pulse $-2V_0$ (i.e., erasing in black) and then successively scanning the scan lines by applying a positive pulse $2V_0$.

[6] See Surguy, Abstract and Figure 4.

That is, Okada teaches that the picture elements are erased at the beginning of each field or frame.[7]

Accordingly, both Mihara and Okada teach that for each field, the scan lines are reset prior to scanning. On the other hand, the claimed invention requires simultaneously resetting the scan lines (i.e., resetting a voltage difference between pixel electrodes and common electrodes) in a field after the scan lines are successively scanned in the field.

Further, in the cited references, a driving potential of the LCD is directly determined between the scanning lines and the data lines, as discussed in your letter of March 22, 2005. This means that a resetting voltage is determined by either one of the scanning lines or the data lines, or by both lines. On the other hand, according to the present invention, a difference of potential between the common electrodes and the pixel electrodes define the reset voltage.

III. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

[7] See Okada, at col. 5, lines 59-63: "all or a part of the picture elements on the whole picture written in the previous field or frame is erased (written in "black") at the same time and then successively written (in "white")."

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